Session 1 10:00 - 12:30 Netherlands III

Radiation Dose Reduction Strategy and its Application as Low-dose CT in Future

10:00 Prof. Hajo Zeeb, Institute for Epidemiology and Prevention Research BIPS
"Basics and Overview of Medical Radiation Doses"

10:35 Prof. Yoshiharu Ohno, Kobe University
"Radiation Dose Management and Dose Reduction Strategy in Clinical Practice"

11:10 Dr. Wolfram Stiller, University Hospital Heidelberg
"Low-dose CT and Computer-aided Diagnosis in the Abdominal Field"

11:45 Assoc. Prof. Sumiaki Matsumoto, Kobe University
"Low-dose CT and Computer-aided Diagnosis in Chest Field"

12:20 Discussion

"The 3rd Kobe University Brussels European Centre Symposium" was held at Thon Hotel EU in Brussels on December 6, 2012. In this symposium, we have a session entitled "Radiation Dose Reduction Strategy and its Application as Low-dose CT in Future". In this session, four speakers have lectures, and discuss with audiences from EU.

The first speaker is Prof. Dr.med. Hajo Zeeb, MSc from Bremen Institute for Prevention Research and Social Medicine (BIPS). He had a lecture entitled "Basics and Overview of Medical Radiation Doses", and present importance of radiation dose reduction, the current situation of radiation dose issue in medical field, and necessity for radiation dose reduction for public health. The second speaker is me, Prof. Yoshiharu Ohno, M.D., Ph.D. from Kobe University. I had a lecture entitled "Radiation Dose Management and Dose Reduction Strategy in Clinical Practice", and present state of the art CT radiation dose reduction strategy, recently developed reconstruction technique for further radiation dose reduction, and its' application in chest CT imaging. The third speaker is Assistant Prof. Dr. Wolfram Stiller, Diplom-Physiker from Heidelberg University. He had a lecture entitled "Low-dose CT and Computer-aided Diagnosis in the Abdominal Field", and present state of the art CT radiation dose reduction strategies, recently developed CT reconstruction technique for further radiation dose reduction, and its' application in abdominal CT imaging. The final speaker is Associate Prof. Sumiaki Matsumoto, M.D., Ph.D. from Kobe University. He had a lecture entitled "Low-dose CT and Computer-aided Diagnosis in Chest Field", and present state of the art computer-aided diagnosis (CAD) and influence of state of the art CT radiation dose reduction technique to CAD in chest CT imaging.

We hope this symposium will contribute future collaborations between Kobe University and EU institution, and obtain fruitful results in near future.

Prof. Hajo Zeeb
Institute for Epidemiology and Prevention Research BIPS, Bremen, Germany

"Basics and Overview of Medical Radiation Doses"

Modern medicine contributes a major share to the overall radiation dose of the population, and this share has been increasing in the past decades. Even if most radiological investigations are justified and contribute to the health of patients, there is a need to aim for the lowest possible doses while maintaining or even improving the quality of radiological images. Computerized tomography is of major interest in this regard as it delivers radiation doses to the patients that are much higher than conventional X-ray in many cases. The presentation looks at the current international trends in medical radiation doses and provides some insight into new epidemiological data on potential long-term risks associated with medical diagnostic imaging, predominantly computerized tomography.

Yoshiharu Ohno, M.D., Ph.D.[1, 2]
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"Radiation Dose Management and Dose Reduction Strategy in Clinical Practice"

CT is a powerful tool for the examination of chest and abdominal diseases because it can depict the disease process far more clearly than chest or abdominal radiographs, and more information than conventional angiography. Technical developments in CT scanners have enabled larger volume coverage with higher resolution and lower noise, but this has led to increased radiation exposure. Previous studies in the United States, United Kingdom, Germany, and Japan have shown approximately twofold increases in the number of CT examinations performed in the last a few decades. Currently, the issue of radiation dose reduction draws wide attention. However, application of reduced-dose CT techniques in clinical practice varies among institutions, which illustrates the lack of a standard protocol for effectively reducing radiation dose to patients in clinical settings.
To show the available data on reducing radiation dose exposure in routine chest and abdominal CT protocols, I will introduce 1) important techniques and factors followed by a review of previous studies of CT radiation dose reduction, 2) results from our international and domestic multi-center studies, 3) newly developed techniques and 4) future applications for CT developing at Advanced Biomedical Imaging Research Center in Kobe University.

Dr. Wolfram Stiller, Dipl.-Phys.
Department of Diagnostic and Interventional Radiology, University Hospital Heidelberg

"Low-dose CT and Computer-aided Diagnosis in the Abdominal Field"

The contribution of CT examinations to collective effective dose caused by all diagnostic procedures involving patients' exposure to ionizing radiation is ever increasing, leading to high interest in its reduction. With regard to radiation dose reduction, abdominal CT examinations pose a challenge inasmuch as the organs and structures of the abdominal region feature inherently low differences in contrast rendering their differentiation difficult, while ionizing radiation is highly absorbed by the dense structures located in this body region. Therefore abdominal CT examinations are normally associated with rather high doses. However, low-dose abdominal CT is still feasible and applicable for clinical conditions which imply an increase in contrast of abdominal anatomy either artificially by using

contrast-enhanced CT for imaging vascular structures or the intestines, or for lesions with inherent high-contrast like renal concrements or metastatic skeletal invasions. Apart from these applications new iterative image reconstruction techniques enable abdominal CT imaging at lower doses while preserving diagnostic quality and confidence. Since the amount of image data generated by CT examinations is very large and requires scrutinous review, computer-assistance for supporting radiological diagnosis and clinical decisions could prove to be valuable. To date, approaches to computer-aided diagnosis on the basis of abdominal CT imaging include the automatic identification of colorectal lesions in virtual coloscopy as well as the automatic segmentation of hepatic lesions or of the liver's vascular system.

Sumiaki Matsumoto, M.D., Ph.D.[1, 2]

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"Low-dose CT and Computer-aided Diagnosis in Chest Field"

Over the last two decades, the technology of CT (computed tomography) has made great improvements. Recent multi-detector-row CT scanners offer remarkable speed of scanning, spatial resolution, and anatomic coverage, allowing for quick acquisition of high-quality 3D CT data of a body part or even the whole body. And nowadays such 3D data can be processed by specialized computer systems aimed for computer-aided diagnosis. Computer-aided diagnosis in radiology can be defined as a diagnosis made by a radiologist who uses the output from a computerized analysis of medical images as a "second opinion" in detecting lesions, assessing extent of disease, and making diagnostic decisions. In the sub-field of chest radiology, lung nodules and pulmonary emphysema constitute important targets for computer-aided diagnosis, because any non-calcified lung nodule may be a manifestation of lung cancer but can be overlooked by radiologists and it is impossible for radiologists to quantitatively assess the extent of emphysema without the use of image processing. This lecture focuses on our approach to computer-aided detection of lung nodules and quantitative assessment of emphysema, in the contexts of global attention to lung cancer screening using low-dose CT and the recent trend towards radiation dose reduction using new iterative reconstruction algorithms.